CyBro OPC

Data Access Server
User Manual

rev. 202

(applies to CyBro OPC v2.0.2 and later)

cybroTech

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General

OPC stands for "OLE for Process Control". It is a specification standardized by OPC foundation (www.opcfoundation.org) which enables OPC client applications to access hardware specific data via OPC servers in a common, well defined way.

CyBro OPC Data Access Server enables OPC clients (SCADA/HMI or other) to connect to CyBro PLCs, using A-bus protocol. OPC client may read or write any location from the complete memory space.

Installation

To install CyBro OPC Server, start the installation archive and follow the instructions. Recommended install directory is C:\Program Files\CyBro OPC Server.

Installation does the following:

- unpacks CyBro OPC files into specified directory
- creates start menu group and icons
- registers OPC server

Note: Installation and setup should be performed using account with administrator privileges. If installation is performed without necessary privileges, OPC server will not function properly.

CyBro OPC Server may be installed on Microsoft Windows 95, 98, ME, NT4, 2000 and XP. Recommended operating system is MS Windows 2000 with the latest available service pack.

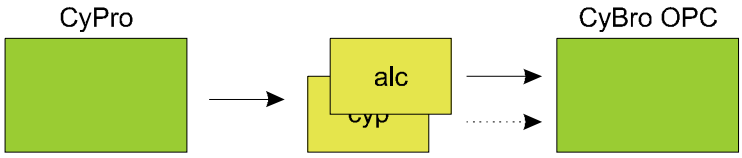
Installation occupies approximately 2.5Mb of disk space. RAM usage depends on number of connected PLCs, number of clients, and number of monitored variables.

To upgrade CyBro OPC, install new release into the same directory, without uninstalling previous version. User settings will be preserved. Before upgrading, close related SCADA screens and shut down OPC server.

To uninstall CyBro OPC, start Control Panel, Add/Remove Programs, select CyBro OPC and press Add/Remove button.

Configuration

CyBro OPC is configured using the allocation file (.alc), generated by CyPro.



If project file (.cyp) with the same name exists in same directory, CyBro OPC will use it to read socket configuration and master/slave configuration. Project file is optional, CyBro OPC is functional without it, but in that case network monitor is not fully functional (no socket data is available), and master/slave configuration can not be automatically determined.

If allocation file is changed, CyBro OPC will automatically update configuration.

Configuration is saved automatically.

Activation code

To use CyBro OPC Server, proper activation code should be entered. Activation code may be obtained from your local distributor.

According to application size, activation code may be:

- small up to 100 tags
- medium up to 1000 tags
- large unlimited number of tags

Depending on distributor, only a "large" licence may be available.

Without the activation code, or when the number of used tags is greater than allowed number of tags, CyBro OPC server will work two hours, and then the warning message will pop up and server will stop. Period of two hours begins when the number of used tags becomes greater than allowed. Restarting the OPC server will provide another two hours. The number of cycles is not limited.

Using the OPC server with 10 or less tags is free, no activation code is needed.

Without the activation code, CyBro OPC server may be used for development/testing purpose only.

Toolbar

 Connect Open communication port and connect to A-bus network.

 Add project Add CyPro project (cyp) to project tree. Although a single project file may enclose all PLC's in network, it is possible to open more than one project. If project contains PLC's that are not currently available, network update time will be considerably increased.

 New monitor Create and open a new monitor list. List may contain any number of PLC or system tags. Monitor is an OPC client. When selected, read request is sent to OPC server periodically every 300ms. When monitor is not selected, no requests are sent, so network performances are not affected.

 Add to monitor Add selected (one or more) tags to a current monitor. Current monitor is the last opened one. Current monitor is indicated by a star symbol (i.e. Monitor3*).

 Refresh tag Refresh (one or more) selected tags. Tags will be refreshed in first available communication cycle. Refresh is performed by setting a read request ( ) to selected tag(s), so the actual response time depends on a number of connected clients and a number of pending requests.

 Refresh PLC Refresh all tags of selected PLC.

Set value Set value of selected (one or more) tags. Value will be written in next available communication cycle. Refresh is performed by setting a write request ( ) to selected tag(s), so the actual response time depends on a number of connected clients and a number of pending requests.

 Tag color Change a color of selected (one or more) tags. Tag has the same color both in PLC and monitor view.

 Move tag up Move tag up.

 Move tag down Move tag down.

Network monitor

Project tree on the leftmost pane may be used as a very effective monitor of network traffic. Network activity is showed in real time, using animated icons, so the network state is visible at a glance.

PLC status

 Active — CyBro is active and there are no communication errors.

 Inactive — CyBro is inactive, there is no communication. For more details, check PLC system tag Sys.ComStatus.

 SCADA request — Indicates that OPC client (SCADA) put a request to read/write one or more PLC tags.

Tag status

 Reading — Read request is pending. Tag will be updated in next available communication cycle.

 Writing — Write request is pending. Tag will be written in next available communication cycle. Tag quality becomes LOCAL_OVERRIDE until next read cycle is performed.

 Idle — No requests are pending, tag will be refreshed in next background refresh cycle. If communication is busy because of SCADA requests, background refresh is not available, and idle tags are not updated (tag quality drops to LAST_KNOWN).

Communication

 Reading — Indicates a data read cycle. Two devices are always activated at (almost) the same time, first one sending the read request, and second one responding with requested data. If only one indicator appears, no response is detected.

 Writing — Indicates a data write cycle. Two devices are always activated at (almost) the same time, first one sending write request and data, and second one sending the acknowledge. If only one indicator appears, no response is detected.

 Master — Indicates network master activity. Indicator appears when master actually send permission-to-send command (SEND_PERM). No indicator shown means no master is active, network is dead. Two or more indicators means more than one master is trying to communicate, so the network is not properly configured.

 Token — Indicates PLC which received permission-to-send command. It is a pair with Master, and appears at the same time.

Socket


Transmit/receive Indicate socket activity. At the moment when socket is sent, both output and input sockets flicker at the same time.


Inactive Indicates inactive socket. In case of output socket, CyBro does not have permission (Token) to send the socket. In case of input socket error is somewhere else: no matching output socket or the socket is not sending.


Error Indicates that socket sent on the network does not match. Testing is performed only for size; data type and order are not checked.

Communication

Master/slave

CyBro OPC server may be either network slave or network master.

By default, master/slave configuration is determined automatically - OPC is master when all CyBro's are slaves. Auto mode works only if project (cyp) file is available. Otherwise auto mode should be turned off, and configuration should be selected manually.

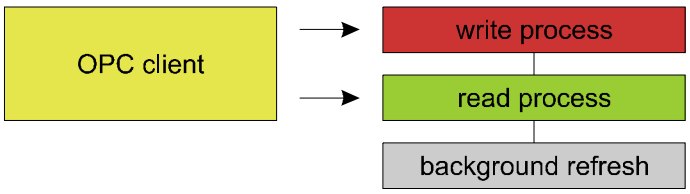
Note: CyBro OPC master is usable only when data is exchanged exclusively between OPC and CyBro, and there is no communication between CyBro's (there are no declared sockets). If project contains at least one socket, network master should be CyBro.

Process priority

Weather OPC is master or slave, it performs three different communication processes:

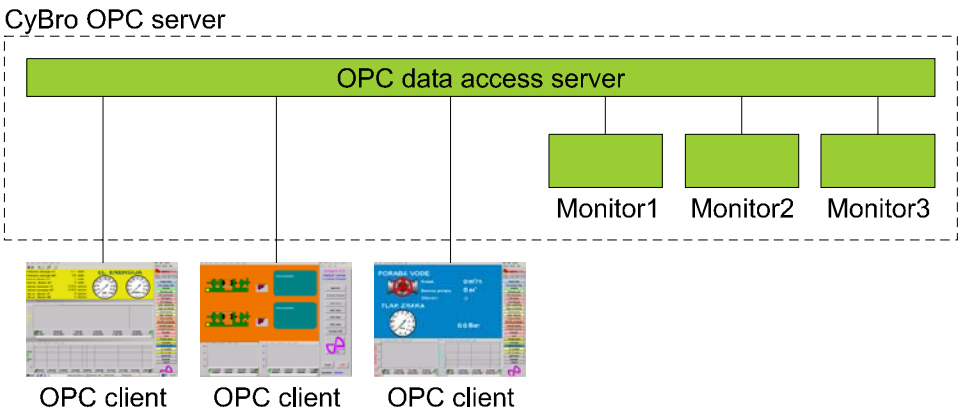
- write process (request to write data to PLC)
- read process (request to read data from PLC)
- background refresh (when no request is pending, refresh all tags)

Write process has top priority, read process is below, and background refresh has lowest priority.



Read and write processes are initiated by OPC client requests (SCADA). If there are no read/write requests, only a background refresh is active. If read/write requests from SCADA are very frequent, background refresh will be stopped.

CyBro OPC data monitor is in fact an OPC client.



Port status

Cable indicator icon on the status bar displays the status of the communication port:

Can't open communication port. The reason may be a wrong port number, or the port may already be used by another application.

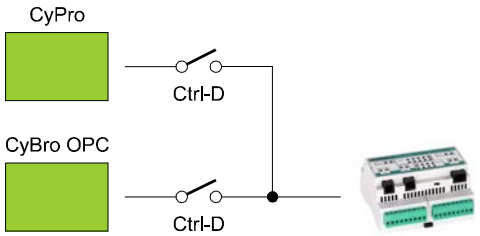
Communication port is open, but the cable is not detected. The reason may be a wrong port number, or bad communication cable. Connect cable to another DB-9 connector, or use another cable.

Communication port open successfully and CyBro cable is connected to the port. If communication is not working, check network master settings.

Port sharing

CyBro network is connected to PC using serial port. Unlike USB or Ethernet, serial port can not be shared among applications, only one application at the time can open the port.

To overcoming the problem, CyBro OPC and CyPro employ a special protocol to take over the communication port. When performs any communication command in CyPro, it will take over the port. Port will not be returned automatically - user needs to return back to CyBro OPC and manually connect to network.



Both applications have the same keyboard shortcut (Ctrl-D) to connect/disconnect the network.

Tag quality

According to OPC specification, each tag has value and quality.

Value is an actual tag value, quantity.

Range of possible values depends on tag type (bit, integer, long, real).

Quality is a property independent of value, and specifies how reliable the actual value is. Quality depends on how and when the value is obtained. When communication is uninterrupted, quality is always "Good". If communication channel is broken, quality first become "Uncertain", then "Bad".

A range of possible qualities is defined by OPC specification. There are three main categories, "Good", "Uncertain" and "Bad. Each category can contain additional info field, which may give a more detailed explanation about the problem cause.

CyBro OPC server implements the following qualities:

Good	Value is updated regularly.
Good, local override	Value is locally overridden, using function "Set Value". Tag status is red (pending to write). After the write command is completed, status becomes green (reading) or gray (idle). When tag value is updated next time, quality changes back to "Good".
Uncertain, last usable	First timeout, last updated value is 5 to 10 seconds old. Possible reason may be a slower network update time, or some communication errors. This is just a warning, not an error.
Bad	Value is unusable, no successful read was performed since OPC server started.
Bad, last known	Second timeout, last updated value is more that 10 seconds old. Communication is broken, so the value is not reliable any more.
Bad, out of service	Activation code expired. More tags than allowed by license is used, development timeout (2 hours) expired.

To adjust "Uncertain" and "Bad" timeouts, open Settings, tab Advanced.

System tags

System tags are virtual tags created and handled by OPC server. Their purpose is to show information about OPC server/client and the network.

Two kinds of system tags are available - those belonging to OPC itself, and those belonging to each PLC.

Value of a system tag can not be changed by user, but there is a command, "Reset sys counters", which resets values of all system tags. It is not possible to reset a single tag.

OPC system tags

ServerStartedAt	Time and date when OPC server is started.
ServerUptime	Time elapsed since OPC server is started.
LicenseType	License type: "not licensed" (<10 tags), "small" (<100 tags), "medium" (<1000 tags) and "large" (unlimited number of tags).
LicenseStatus	License status: "ok", "30 min left", "expired".
TagLimit	Total number of monitored tags allowed by given license.
ClientsConnected	Number of connected OPC clients.
MonitoredTags	Total number of tags monitored by all connected OPC clients.
ProjectCount	Number of loaded CyPro projects.
PlcCount	Total number of PLC's in all loaded projects.
ComStatus	Communication status: "disconnected", "ok", "idle (no tags)", "error: can't open COM port", "error: no communication", "error: master running, but no requests to OPC", "error: some PLCs are ok, some are not responding", "error: no PLC is responding".
ComReceiveCount	Total number of good communication messages received.
ComTransmitCount	Total number of communication messages sent.
ComErrorCount	Total number of communication errors (including timeouts, bad messages and negative acknowledges).
LastReceivedAt	Timestamp of last good communication message received.
LastReceivedNad	Device from which last good communication message is received.
LastResponseTime	Response time of last good communication cycle.
MaximumResponseTime	Maximum response time encountered.
MaximumResponseTimeAt	Timestamp when maximum response time is encountered.
MaximumResponseTimeNad	Device for which maximum response time is encountered.
ComTimeoutCount	Total number of communication timeouts.
LastTimeoutAt	Timestamp of last detected OPC communication timeout.
LastTimeoutNad	Last device that caused communication timeout.
BadMessageCount	Total number of bad communication messages received.
LastBadMessageAt	Timestamp of last detected bad communication message.
LastBadMessageNad	Last device from which bad communication message is received.
NegativeAckCount	Total number of negative acknowledges received.
LastNegativeAckAt	Timestamp of last detected negative acknowledge.
LastNegativeAckNad	Last device from which negative acknowledge is received.
TagsToRead	Total number of tags waiting to be read (excluding background refresh).
TagsToWrite	Total number of tags waiting to be written.

ReadCount	Number of OPC read cycles (excluding background refresh).
LastReadAt	Timestamp of last succesfull OPC read (excluding background refresh).
LastReadNad	PLC accessed in last successfull OPC read (excluding background refresh).
ReadErrorCount	Number of OPC read errors (excluding background refresh).
WriteCount	Number of OPC write cycles.
LastWriteAt	Timestamp of last succesfull OPC write.
LastWriteNad	PLC accessed in last successfull OPC write.
WriteErrorCount	Number of OPC write errors.
BackgroundRefreshCount	Number of OPC background refresh cycles.
LastBackgroundRefreshAt	Timestamp of last succesfull OPC background refresh.
LastBackgroundRefreshNad	PLC accessed in last succesfull OPC background refresh.
BackgroundRefreshErrorCount	Number of OPC background refresh errors.
LastBackgroundRefreshCycle	Cycle time to background refresh all tags of all PLC's.
MasterNad	Master NAD.
MasterRequestCount	Number of requests sent from master to any device in the network.
MasterToOpcRequestCount	Number of requests sent from network master to OPC.
LastMasterCycle	Time between last two requests sent from network master to any PLC.
LastMasterToOpcCycle	Time between last two requests sent from network master to OPC server.
LastNetworkSlaveNad	Last device accessed by network master.
NetworkResponseCount	Total number of responses sent to network master.
LastNetworkResponseAt	Timestamp of last response to network master.
LastNetworkResponseNad	Last device responsed to network master.
NetworkSocketCount	Total number of sockets sent in the network.
LastNetworkSocketAt	Timestamp of last socket sent.
LastNetworkSocketNad	Last device which sent a socket.
TimeSinceLastMasterRequest	Time since last request from master received.
TimeSinceLastMasterActivity	Time since last communication activity detected.

CyBro system tags

NAD	Actual CyBro network address (may be NAD or NAD alias).
TimedOut	True if CyBro is not responding to communication requests.
Master	True if CyBro is network master, false otherwise.
ComStatus	Communication status: "ok", "disconected", "idle (no tags)", "error: can't open COM port", "error: no communication", "error: master running, but no requests to OPC", "error: PLC is not responding".
ComReceiveCount	Total number of good communication messages received from this PLC.
ComTransmitCount	Total number of communication messages sent to this PLC.
ComErrorCount	Total number of communication errors from this PLC (including timeouts, bad messages and negative acknowledges).
LastReceivedAt	Timestamp of last good communication message received.
LastResponseTime	Response time of last good communication cycle.
MaximumResponseTime	Maximum response time encountered.

MaximumResponseTimeAt ..... Timestamp when maximum response time is encountered.
ComTimeoutCount ..... Total number of communication timeouts.
LastTimeoutAt ..... Timestamp of last detected OPC communication timeout.
BadMessageCount ..... Total number of invalid communication messages received.
LastBadMessageAt ..... Timestamp of last detected invalid communication message.
NegativeAckCount ..... Total number of negative acknowledges received.
LastNegativeAckAt ..... Timestamp of last detected negative acknowledge.
TagsToRead ..... Number of tags waiting to be read (excluding background refresh).
TagsToWrite ..... Number of tags waiting to be written.
ReadCount ..... Number of read cycles (excluding background refresh).
ReadErrorCount ..... Number of read errors (excluding background refresh).
WriteCount ..... Number of write cycles.
WriteErrorCount ..... Number of write errors.
BackgroundRefreshCount ..... Number of background refresh cycles.
BackgroundRefreshErrorCount ..... Number of background refresh errors.
MonitoredTags ..... Total number of tags monitored by all connected OPC clients.
SystemStatus ..... System status: "loader", "kernel".
PLCStatus ..... PLC status: "stop", "run", "error".

Keyboard shortcuts

Ctrl-O ..... Add project
Ctrl-N ..... New monitor
Ctrl-F4 ..... Close monitor

Ctrl-A ..... Select all tags
Ctrl-M ..... Add selected tag(s) to monitor
Delete ..... Remove selected tag(s) from monitor

Ctrl-D ..... Connect/disconnect

Tab ..... Select active window (project tree or tag list)
Up/Down ..... Move selection up/down

Enter ..... Set tag(s) value
Space ..... Toggle tag(s) value (bit only)
Ctrl-Up/Down ..... Move selected tag(s) up/down

F9 ..... Refresh selected tag(s)
F10 ..... Refresh all PLC tags
F11 ..... Refresh all currently visible tags

F5 ..... Settings

Alt-F4 ..... Close OPC window
Ctrl-Alt-F4 ..... Shutdown OPC server

Technical Specifications

OPC Server ID: CyProOPC.DA2

Supported OPC versions:..... 1.0, 1.0a and 2.0

Supported PLCs:..... CyPro/CyBro-1 v1.9.0
CyPro/CyBro-2 v2.2.0 and above

Communication protocol:..... A-bus, 19200, N, 8, 1

Used A-bus commands: ..... RD_DATA, WR_DATA, RD_STATUS